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ABSTRACT

Included in this module are five activities dealing with modes of transportation in the urban environment. The activities include: (1) a discussion of transportation considerations in urban areas; (2) discussion of bikeways and their desirability in the urban environment; (3) the bikeway and the environment; (4) designing a bikeway; and (5) decision-making concerning a bikeway. Also included are an overview, teacher background information, an activity preview, and a pretest. A module evaluation form is provided. (RE)

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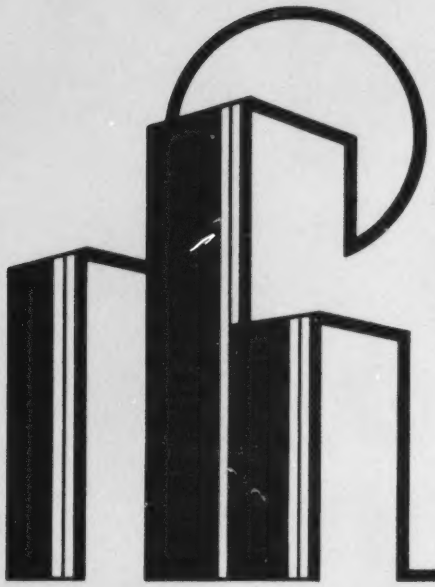

Curriculum Module III

Urban Environmental Education Project

Urban Transportation: Where Are We Going?

developed by Ellen Bell

SE 030 514

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URBAN ENVIRONMENTAL EDUCATION PROJECT

Curriculum Module III

Urban Transportation: Where Are We Going?

developed by

Ellen Bell

July 1979

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Urban Transportation: Where Are We Going?

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Urban Transportation: Where Are We Going?

OVERVIEW

> "None of these changes (making cars cleaner and smaller) will do much to relieve traffic congestion or make it easier to get around in cities . . . For all its flexibility the car is not the best possible way to get to or move around in very busy places."
>
> - Henry Ford II

Most people who commute daily by car to the central business district of any large American city would agree with Henry Ford II. Rush hour in our urban centers is a noxious mix of congestion, air pollutants, and noise, all contributed by the automobile, America's expensive solution to the problem of personal transit. Americans are willing to accept a certain amount of inconvenience to enjoy their preferred method of transportation, but the automobile's dependence on non-renewable resources may force us to find other ways of moving people.

What "other ways" are there to move people? Perhaps advanced technology will come up with innovative methods -- something like electric-powered tractor-trains, or three-wheeled battery-powered scooters, or a vehicle not yet imagined. But one answer to the question may be not in the future, but behind us -- the bicycle.

Bicycles have a lot going for them as a form of transportation: they provide good exercise; they are very mobile; they are relatively inexpensive to purchase, operate, and maintain; they don't pollute; they are not noisy; they don't take up much room. Of course, no mode of transportation is perfect, and the bicycle does have some serious drawbacks.

In this module we will examine the bicycle as an alternative to our dependence on the car as a mode of transportation. Students are encouraged to raise and answer questions such as:

What has the car done to the urban environment?

How willing are people to use bikes as transportation if safe, convenient facilities are provided?

How can the disadvantages of bicycling be overcome?

What forms might facilities for bicycling take?

To what extent should society commit resources to encourage bicycling?

The activities in this module are designed to help students reach a consensus on a quality of life goal for transportation in the urban environment and then to evaluate a bikeway as one method of achieving that goal. (Bicycles are considered as one component of a coordinated transportation system, <u>not</u> as a total substitute for automobiles or other modes of transport.)

TEACHER BACKGROUND INFORMATION

Bicycles became an important means of transportation during the nineteenth century. The bicycle was the first machine to be mass produced for personal transportation. It is interesting to note that many of the early automobile manufacturers began as bicycle builders: Glen Olds, Henry Ford, the Chevrolet brothers, and the Duesenberg brothers. The car owes much to the bicycle: pneumatic and cord tires, ball bearings, differential steering, expansion brakes, and even paved roads were developed for bicycles. The automobile had certain undenied advantages over the bicycle, however, and by the early twentieth century the bicycle no longer was a major means of transportation in the United States.

Times change, and perhaps the bicycle now deserves reconsideration as an important mode of urban transportation. The bicycle needs no fuel, gives off no fumes, and makes little or no noise. Riding a bicycle is not only good for the environment, it is a boon for the rider's personal well-being. Bike riding helps to control body weight; it is good for the cardiovascular system; it helps to develop a slower heart rate, lower blood pressure, and improve blood supply to all muscles including the heart; it increases strength and endurance. All this and it is economical, too. A bicycle costs a lot less than a car, and repairs and maintenance will generally run from 0.2¢ to 2¢ a mile. Studies have even shown the bicycle to be more efficient than the automobile: bicycles are the fastest form of urban transportation for trips less than three miles (Breines and Dean, 1974), and they provide door-to-door service.

Bicycling does have disadvantages: high accident rates, bicycle theft, exposure to auto pollutants and bad weather conditions, and a perception that bicycling is less convenient than the auto. It is possible to overcome each disadvantage. High bicycle accident rates are mainly attributable to close encounters with cars. The obvious solution is to separate bikes from motor vehicle traffic; the way to do it is to construct bikeways. "In the streets, bicyclists must compete with cars, trucks, buses, and taxis. It is an unequal contest" (Breines and Dean, 1974, p. 79). Bicycle theft rates can be lowered by improved registration procedures, use of better locks, and more secure parking arrangements. Auto pollutants may become less of a problem as more people abandon their cars. Bad weather conditions require the right clothing, or, for the faint-hearted, public transportation.

The perception that bicycling is less convenient than travel by car can be explained in part by the special position the automobile occupies in our society. "If . . . the private automobile driver is forced to pay more of the social costs the auto imposes on congested areas . . . the price of driving will rise" (Dougherty and Lawrence, 1974, p. 22). If safe bicycle routes are provided and if the costs of driving a car rise, bicycle use will increase.

For long trips, bicycles can be part of a dual-mode transportation system, i.e., the bike can be used for part of the trip along with the automobile or mass transit. The central, most congested parts of urban areas can be reached on bicycle, while outlying parking is provided for automobiles. Alternatively, bikes could be used to reach outlying mass transit stations, with the mass transit mode providing access to the congested urban center.

In any case, the obstacles to bicycling can be surmounted if people want to do it. The bicycle is used extensively in most of Europe where cities are crowded, car ownership is expensive, and gasoline costs well over two dollars a gallon. Closer to home, several states (including Michigan whose economy is geared to cars) have set aside a portion of gasoline tax revenues for investment in bicycle facilities. Recreational bicycling facilities are increasing in number: the Potomac Heritage Trail begins in Southwestern Pennsylvania at the headwaters of the Potomac River and continues on downstream for 825 miles; the Chesapeake and Ohio Canal National Historic Park, the California Aqueduct Bikeway, and the Bear Creek Bikeway in Medford, Oregon, which uses part of an interstate highway right-of-way, are just a few examples of recreational facilities for bicyclists.

In Davis, California, 60 percent of all rush hour traffic is on bicycles. Davis does have a mild climate, flat terrain, and wide streets. It is a college town, and most of the population lives within two miles of downtown. Consequently, the bicycle can and does work as a form of serious, commuter transportation.

The federal government is interested in promoting bicycle use. The Environmental Protection Agency is encouraging the development of a bikeway to Pittsburgh's Central Business District as one way of meeting air pollution standards in Allegheny County. The Department of Transportation has funds allocated for bikeways.

Even Penn DOT (Pennsylvania Department of Transportation) is interested in bikeways. Every major highway proposal in Pennsylvania must investigate

the possibility of including bikeways. While seven have been proposed in southwestern Pennsylvania, only one (the East Street Bikeway) has actually been designed.

Can bikeways work in Allegheny County? A study commissioned by the Allegheny County Department of Planning and Development has come up with a plan for a 171-mile county-wide bikeway. The proposed bikeway connects North and South Parks to downtown Pittsburgh, but most of the bikeway (125 miles) is in eastern Allegheny County because that is where the level land is. The planners of the bikeway hope that it will give people an alternative to driving and be used for recreational cycling.

A bikeway, then, has been designed for Allegheny County. Its construction costs, estimated at $5,600,000, would probably be paid by federal and state funds. Local governments would have to pay the maintenance costs, but these costs, as estimated by the Feasibility Study for a Bikeway System in Allegheny County, do not appear to be high (see Activity 5). Economically, a bike can work.

But can it work politically? Are the people and their elected officials ready to buy it? Public sentiment is strongly against increased taxes; most people probably feel that any money spent on transportation locally should go to repairing the decrepit bridges and roads. The Pittsburgh Press has come out against the bikeway in a recent (October 3, 1978) editorial.

> . . . It's hard to believe vast hordes of (people) would take to the bikeway every day just for the fun of it. Or that many persons would want to cycle up to a dozen miles round-trip daily to get to work or school . . .

> Although it's certainly important for a major metropolitan county to provide recreational activities for its citizens, it also should guard against overdoing one such opportunity.
>
> Indeed if bikeways are the rage this year, what's it going to be next year? Skateboard rinks?

Where is urban transportation in Allegheny County going? How likely is it that the bikeway is an idea whose time has come? The activities in this module are intended to raise such questions, encourage students to explore possible responses, and make reasoned decisions.

Annotated Bibliography

Balshone, Bruce., Deering, Paul L., McCarl, Brian D. Bicycle Transit: Its Planning and Design. New York: Praeger, 1975.
An excellent reference for all aspects of bikeway planning and design, this book is suitable for better readers in grades 7 to 9.

Breines, Simon, and Dean, William J. The Pedestrian Revolution: Streets Without Cars. New York: Vintage, 1974.
This attractive, visually-appealing book describes many aspects of the pedestrian revolution, including bicycles. It contains historical information on the bicycle, as well as a rationale for the bicycle's use as a commuting method. This book is suitable for better readers in grades 7-9.

Dougherty, Nina, and Lawrence, William. Bicycle Transportation. United States Environmental Protection Agency, 1974. (U.S. Government Printing Office, Washington, DC 20402, $0.95)
This book presents the advantages of the bicycle as a means of transportation, environmental benefits of the increased use of bicycles, and specific ways bicycles can be used as urban transportation. Examples of successful bike routes are given along with federal agencies interested in promoting bicycle use. This book can be used by better readers in grades 7-9.

Citizens' Advisory Committee on Environmental Quality. From Rails to Trails. Washington, DC: U.S. Government Printing Office, 1975.
This booklet gives a step-by-step plan for converting abandoned rights-of-way to recreation trails, especially bikeways. Advantages of abandoned transportation routes are convincingly presented. A checklist of specific points to consider when evaluating an abandoned right-of-way is provided, along with addresses of government agencies to contact. Middle/junior high school students will find this booklet a practical guide for doing something about bikeways.

GWSM, Inc., and Mackin Engineering Co. Feasibility Study for a Bikeway System in Allegheny County. Allegheny County Department of Planning and Development, February 1978.
This study is valuable for its wealth of technical information on bikeways and its thorough bibliography.

National Geographic Society. Transportation in America. Washington, DC: National Geographic Society, 1974.
An informative and interesting set of five sound (cassettes or records) filmstrips including: Yesterday's Travel, People on the Move, Supplying the Market, Traffic in the City, and Tomorrow's Travel. Each filmstrip is accompanied by a booklet (with text), objectives, summary, vocabulary, and questions for discussion.

Pollock, Rita L. A Study of Bikeway Demand Analysis. University of Pittsburgh, Internship Report, Graduate School of Public and International Affairs, April 1976.
In addition to an analysis of bikeway demand in the Pittsburgh area, this report provides a comprehensive overview of the proposed East Street Bikeway (part of the East Street Valley Expressway).

ACTIVITY PREVIEW

This module consists of five activities. Each activity will take a minimum of 45 minutes of class time. Supplementary activities also are included; their use would increase the class time needed.

Activity 1. Transportation in Urban Environments

Using charts and graphs, students compare the efficiency and energy use of various forms of transportation. In a class discussion, students evaluate the possible environmental benefits of pedestrianism and formulate quality of life goals for transportation in urban environments.

Activity 2. Who Wants a Bikeway?

Through the use and analysis of a survey, students attempt to determine the support within their community for a bikeway.

Activity 3. The Bikeway and the Environment

Using charts and maps, students evaluate how the bikeway might affect the environment and how the environment might affect the bikeway. Climate and topography provide the focus for this activity.

Activity 4. Designing a Bikeway

In small groups, students investigate several topics related to bikeway design: laws and ordinances, space requirements, bikeway classifications, signs and markings, and parking and security. At the conclusion of this activity, students reach a consensus on a bikeway design.

Activity 5. Should Allegheny County Construct a Bikeway?

This activity encourages students to reach a policy decision using information and conclusions from previous activities as well as data on bikeway costs. How desirable is a bikeway as a way to achieve urban environmental goals?

NOTE: A knowledge pretest for students, reprinted on the following pages, is provided in the Student Materials Packet.

MODULE III PRETEST

Urban Transportation: Where Are We Going?

1. Which statement about bikeways is true?

   a. Bikeways are special roads for bikes, motorcycles, and other two-wheeled vehicles.
   b. The costs of building bikeways are paid by bicycle registration fees.
   c. Bikeways are special routes set up for bicycle riders.
   d. People who use bikeways must have drivers' licenses.

2. A pedestrian is someone who

   a. does not own a car.
   b. uses public transportation.
   c. has never flown in an airplane.
   d. is walking.

3. Topography is

   a. the study of tops.
   b. the description of a region's physical features.
   c. a lot like geography.
   d. a map of an area.

4. A questionnaire is <u>not</u> useful for

   a. learning how people feel about something.
   b. giving people a chance to express their opinions.
   c. studying about population density.
   d. finding out what people want.

5. Traffic bottlenecks are usually found in

   a. rural areas.
   b. suburban neighborhoods.
   c. urban residential areas.
   d. urban business districts.

6. A Btu (British thermal unit) measures

   a. air pollution.
   b. heat.
   c. energy waste.
   d. inflation.

7. Which is a state regulation for bike riding in Pennsylvania?

   a. Bicycles must be inspected for safety once a year.
   b. Bike riders must be at least 12 years old.
   c. Bike riders must yield the right-of-way to pedestrians on sidewalks and bike paths.
   d. Bike riders must pass a written test.

8. Obstacles to bicycling as an alternative to driving cars in Allegheny County include all of the following, except

   a. frequently poor weather conditions.
   b. hilly topography.
   c. lack of secure parking facilities.
   d. high costs.

9. For urban transportation, the auto is

   a. more energy efficient than the bicycle.
   b. less energy efficient than the bicycle.
   c. about as energy efficient as the bicycle.
   d. more energy efficient than any other mode.

10. A major argument against building a bikeway in Allegheny county involves

   a. the cost to taxpayers.
   b. the environmental effects.
   c. transportation efficiency.
   d. energy use.

ACTIVITY 1. Transportation in Urban Environments

Objectives: This activity involves students in evaluating the advantages and disadvantages of various modes of transportation in the urban environment, comparing the energy consumption of several modes of transportation, separating facts from opinions, classifying information obtained from a graph, defining pedestrianism, and formulating a statement about transportation and the quality of life in urban environments.

Organizing Ideas: Urban, industrial societies depend on efficient and convenient means of transportation.

1. We rely so much on the car as a mode of transportation that it has shaped the appearance of our urban environment and our way of life.
2. Cars are an inefficient means of short distance transportation in urban areas; the bicycle may be a reasonable alternative.

Resources:

Balshone, Bruce L., Deering, Paul L., and McCarl, Brian D. Bicycle Transit: Its Planning and Design. New York: Praeger, 1975.

Breines, Simon, and Dean, William J. The Pedestrian Revolution: Streets Without Cars. New York: Vintage, 1974.

Dougherty, Nina, and Lawrence, William. Bicycle Transportation. United States Environmental Protection Agency, 1974. (U.S. Government Printing Office, Washington, DC 20402, $.95)

GWSM, Inc., and Mackin Engineering Co. Feasibility Study for a Bikeway System in Allegheny County. Allegheny County Department of Planning and Development, February 1978.

Student Materials:

Handouts (provided in the Student Materials Packet)

Transportation in Urban Environments

Part A (SM 1.1, 1.2)

Part B (SM 1.3, 1.4)

Part C (SM 1.5)

Part D (SM 1.6)

Parts E and F (SM 1.7)

Decision-Making Map

Transparency (provided in the Student Materials Packet)

Decision-Making Map (same as handout)

Suggested Procedures:

1. As an introduction, you might focus the students' attention on transportation by asking them how they got to school this morning. Encourage them to identify advantages and disadvantages of the methods of transportation they used.

2. Distribute Part A of the handout, "Transportation in Urban Environments," (SM 1.1-1.2) to the class, and ask them to work individually or in small groups to complete the chart on the basis of their own transportation use.

   Answers to the questions raised in Part A might be shared by the class as a group. Answers to the first two questions will be varied. With the third question, encourage consideration of various kinds of costs, social as well as economic. As an optional follow-up to the fourth question,

ask students to react to the following statement:

> "Bikes are a transit mode with minimal environmental impact." (Balshone et al., 1975, p. 21)

NOTE: If discussion is extended, Parts B, C, D, and E of this activity might be overviewed and completed as homework. Part F might require a second class period.

3. Students might work on Part B, SM 1.3-4 (interpreting graphs) individually or as a class group.
   a. Inter-city transportation ties different cities together; urban transportation is within one city.
   b. Aircraft are least efficient; buses are most efficient.
   c. Autos are least efficient; bicycling is most efficient.
   d. 3800 Btu intercity; 8000 Btu urban; cars operate best on clear, uninterrupted road. The average speed of a car in an urban center is 5 mph or less. In congested areas nearly 90% of the latent energy of gasoline is wasted as heat and air pollution.
   e. Energy efficient forms of transportation might take too much time, not go where you want to go, not carry your baggage.
4. Parts C and D, SM 1.5 and SM 1.6, are intended for reinforcement and skill development. The answers to question #1 are F, O, F, F, F.
5. Part E, SM 1.7, (pedestrianism) might be completed either during a class discussion or by students working individually.

   Disadvantages of pedestrianism include bicycle theft, high accident rates, exposure to auto pollutants, and bad weather. Advantages of pedestrianism include good exercise, mobility, door-to-door service, low cost, recreational and environmental benefits (saving gasoline, cleaner air, less noise, less congestion).

6. Part F, SM 1.7, introduces the Decision-Making Map and encourages students to begin thinking about quality of life goals for transportation in urban environments and ways to achieve identified goals. Either the Decision-Making Map handout or transparency (or both) might be used here to introduce and explain the decision-making process. In subsequent activities, students will have opportunities to return to the map and complete the decision-making process.

   a. Questions such as the following might be raised to help students state the environmental issue:

      How dependent are we on cars?

      How has the car shaped the environment of urban areas?

      How would our urban environment be better (worse) if cars were eliminated from urban centers?

      When you think about transportation in urban areas, what environmental issues concern you most? (e.g., air pollution, noise, congestion, waste of non-renewable resources)

      At this point students should be ready to state an environmental issue(s) on their Decision-Making Maps. They should recognize that there is no single "right" issue or answer.

   b. Next, focus on a quality of life goal: What kind of urban environment do you want? (Cleaner air? Less noise? Less traffic congestion?) Students then formulate a quality of life goal that responds to the environmental concerns they have expressed.

   c. After the issue(s) and goal(s) have been identified, ask: What are some reasonable ways to get us to the quality of life goal that we've set? (Point out the possibilities of mixed-mode transportation systems, which involve the bicycle and at least one other mode of transportation. If necessary, encourage students to view the bicycle as an alternative to our current dependence on the automobile.)

SM 1.1

Transportation in Urban Environments

A. Transportation is the act of carrying things or people (or both) from one place to another place. There are many transportation modes (methods or ways) available to us. Each mode of transportation has advantages and disadvantages. Completing the chart below will help you to reach some conclusions about the role of transportation in the urban environment. Briefly note your answers in the space provided.

Mode of Transportation	How often do you use this mode?	How do you feel about this mode of transportation?	How much does it cost to use?	What effects does it have on the environment?
Airplane				
Car				
Truck				
Train				
Bus				
Bicycle				
Boat				
Walking				

After you have completed the chart, use the information to help you evaluate transportation modes.

1. Which mode do you use most frequently?_____
   Why?

   Least frequently?_____
   Why?

2. Which mode do you enjoy using the most?_____
   Why?

   The least?_____
   Why?

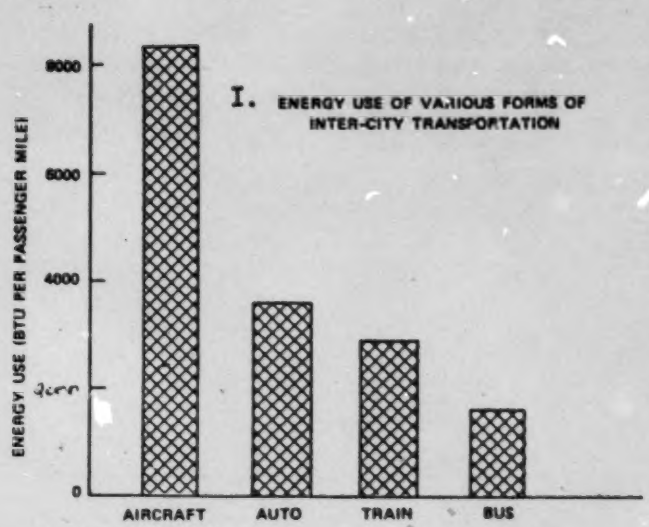
3. Which mode has the highest costs to the user?_____
   Why?

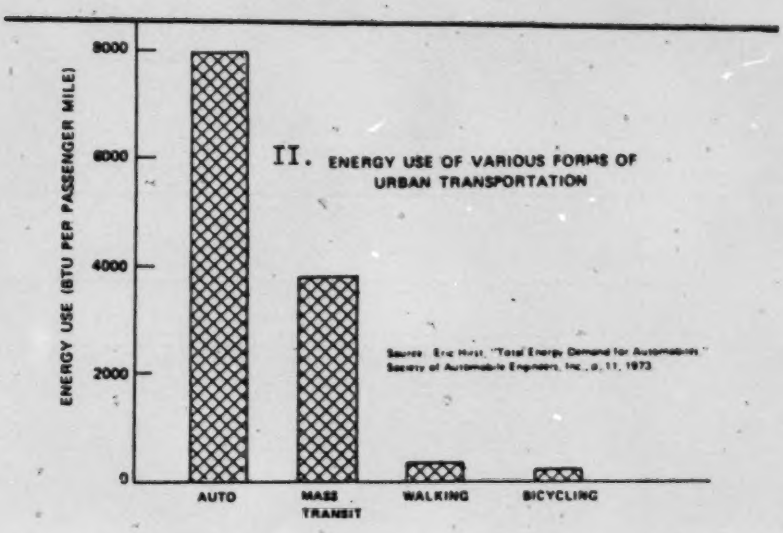
   Which mode has the lowest costs?_____
   Why?

4. Which mode has the greatest effects on the environment?_____
   What are some examples of these effects?

   Which mode has the smallest effects on the environment?_____
   Why is there little environmental impact?

B. Before you come to any conclusions about "good" or "bad" modes of transportation, study the bar graphs below, and answer the questions that follow them. Each graph gives information on the energy use of four modes of transportation. Energy use is expressed in terms of "Btu per passenger mile." A Btu is a British thermal unit; it is a measure of heat.





1. Graph I provides information about the energy use of four modes of inter-city transportation. What does "inter-city" mean?

   Graph II gives the energy use of four modes of urban transportation. What is "urban transportation"?

2. Which mode of inter-city transportation is the least efficient (uses the most energy for every passenger mile)?

   Which mode of inter-city transportation is the most efficient (uses the smallest amount of energy for every passenger mile)?

3. Which mode of urban transportation is the least efficient?

   Which mode of urban transportation is the most efficient?

4. An auto uses ____ Btu per passenger mile in inter-city transportation; the same auto uses ____ Btu per passenger mile in urban transportation. Why is there such a difference?

5. How might a mode of transportation that uses little energy be inefficient in other ways?

C. More on Energy Use and Transportation

1. Distinguishing Facts from Opinions. Using the information in the previous graphs, read the following statements and place an F in the space beside the facts (statements that can be verified or proven) and an O in the space beside the opinions (statements that some people believe or feel but that cannot be verified).

_____ a. An aircraft uses more than 8000 Btu per passenger mile.

_____ b. Walking is better for you than using mass transit.

_____ c. Walking uses less energy than a bus.

_____ d. The form of transportation that uses the least energy is bicycling.

_____ e. In urban transportation, autos use twice as much energy as mass transit.

2. Classifying information. Using the information in the previous graphs, list the modes of transportation for each category.

Modes of transportation that use:

Little energy = 2000 Btu/ passenger mile or less.	Much energy = 4000 Btu/passenger mile or more.
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____

D. Look at the table below. Then, use this information to fill in the blanks in the paragraph that follows.

Bicycle and Automobile Sales

Year	Bicycle Sales (Millions)	Automobile Sales (Millions)
1968	7.5	8.8
1969	7.1	8.2
1970	6.9	6.5
1971	8.9	8.6
1972	13.7	11.0

Source: Some Facts About the Current Bike Explosion. Bicycle Institute of America, 1973.

In 1970, Americans purchased more _____ than _____. This is the first time more _____ were sold since _____ were introduced to the American people more than 75 years ago. Nineteen thirteen was the first year that more cars were produced than wagons and buggies. If 1913 is seen as the beginning of America's conquest by the car, perhaps 1970 will one day be seen as the beginning of America's return to pedestrianism. What do you think about this possibility?

E. Pedestrianism is a movement to return America's urban areas to people who are using "their own two feet" to transport themselves.

1. Pedestrianism (according to the definition above) includes more than people walking. What other modes of transportation would fit this definition?

2. What are some disadvantages of pedestrianism? List at least three.

3. What are some advantages of pedestrianism? List at least three.

F. Modes of transportation used in the urban environment have shaped the the urban environment. For example, it is estimated that 1/3 of a city's ground area is streets, streets that are controlled by cars. What are your quality of life goals for transportation in urban environments? What are the choices -- ways to achieve your quality of life goal(s)?

Goals	Choices

ACTIVITY 2. Who Wants a Bikeway?

Objectives: In this activity, students list three methods used to estimate demand; administer, tally, and analyze a survey; and identify two advantages and two disadvantages of the survey as a measure of demand.

Organizing Ideas: A questionnaire survey is a useful way to estimate community demand and support for a bikeway.

1. sampling
2. questionnaire bias

Resources:

Balshone, Bruce L., Deering, Paul L., and McCarl, Brian D. Bicycle Transit: Its Planning and Design. New York: Praeger, 1975.

Breines, Simon, and Dean, William J. The Pedestrian Revolution: Streets Without Cars. New York: Vintage, 1974.

Pollock, Rita L. A Study of Bikeway Demand Analysis. University of Pittsburgh, Internship Report, Graduate School of Public and International Affairs, April 1976.

Student Materials:

Handouts (provided in the Student Materials Packet)

Who Wants a Bikeway? (SM 2.1)

Bikeway Questionnaire (SM 2.2)

Bikeway Questionnaire Results (SM 2.3, 2.4)

Suggested Procedures:

NOTE: Activity 2 requires approximately 15 minutes of one class period to introduce the questionnaire to students, and one entire class period to analyze the data.

1. The quotation from Breines and Dean at the beginning of, "Who Wants a Bikeway?" (SM 2.1) introduces the idea of a bikeway. After students have read the quote, involve them in a brief discussion with questions such as:

   a. When you are riding a bicycle on a busy street, what are some of your biggest problems?

   b. Have you ever had a close encounter with a car (truck, bus) while you were riding a bike? (What happened?)

   c. How true is it that the car leaves no room for the bicycle? (Why is that so?)

   d. If the car does not leave room for the bicycle, how can room be found for the bicycle?

   Then, ask students to finish reading the handout in preparation for conducting the bikeway survey.

2. You might introduce the questionnaire, SM 2.2, to your students in any one of several ways. For example:

   a. Ask students to read the questionnaire and decide what information the questionnaire is designed to collect.

   b. Ask students what information would be needed to decide if a bikeway has community support. Then see if the questionnaire will get that information. If not, ask students to modify it.

   c. An optional activity would involve students in designing their own survey.

3. Talk with your students about the importance of obtaining a varied sample, encouraging people to be complete and honest in their replies,

and being polite when approaching people to respond to the questionnaire. Also consider: Why is it an anonymous survey? Why should a person only complete the survey once?

Review the survey questions with your class, and clarify any misunderstandings that appear regarding substance or procedures.

4. SM 2.3-4, "Bikeway Questionnaire Results" involves a two-step analysis of the data. Working in groups of 5-10, students first complete a tally sheet (a copy of the questionnaire where responses are scored) and then answer questions 1-7 on the handout.
   a. Other surveys have found slightly less than 50 percent of the families in Allegheny County own bicycles.
   b. In answering question #4 of the survey, people should have checked only one answer. The percent figures should therefore add up to 100.
   c. In answering question #5 of the survey, people could have checked more than one answer. The percent figures may add up to over 100.
5. During follow-up discussion of the survey results, the following questions might be considered?
   a. Did all groups get the same results? (Why? What does that mean?) What might happen if all the results were combined to make a larger sample?
   b. What are some advantages of a survey? (gives people a chance to express their opinions, you can find out a lot of information quickly)
   c. What are some disadvantages of a survey? (reliability of the information you get may be questionable, takes time to administer and analyze the results)

d. Do people in our community seem to want a bikeway? How willing would they be to support a bikeway with tax money?

6. If students conclude that their community does not want a bikeway, you might ask them to react to the statements below:

> "Urban bikeways are like highways: a good system will generate increased use." (Breines and Dean, p. 82)
>
> ". . . It is unreasonable to expect demand to be manifested for facilities with which people have no experience and of which they have little or no knowledge." (Pollock, p. 12)

Or, to suggest the desirability of further study of bikeways despite apparent public indifference or opposition, provide examples to illustrate (a) people's tendency to be skeptical of (or resistant to) new inventions or changes in their ways of living and thinking (e.g., initial negative reactions to the theories of Copernicus and Galileo, some people's reluctance to fly on airplanes), or (b) how some people are voluntarily returning to "old" ways of doing things (e.g., using wood burning fireplaces for heat, growing their own produce in "city gardens").

Who Wants a Bikeway?

One way to improve the urban environment is to encourage people to use modes of transportation other than cars.

> "These millions of bikes (owned by Americans) demand to be used. But in the larger, built-up cities, the automobile simply leaves no room for the bicycle." (Breines and Dean, p. 78)

Allegheny County has been studying plans for a 171 mile bikeway linking North Park, South Park, the East End, and Downtown. How good an idea is a bikeway? How many people would use it? Who will use it?

In this activity, you will have a chance to analyze demand and support for a bikeway in your community. There are three general ways to estimate bikeway demands:

1. Indirect methods: includes obtaining such information as bicycle sales figures, accident and theft reports, and bike registration data (registration is required, for example, in East McKeesport, McKeesport, and Oakmont).

2. Qualitative methods: includes talking to people and groups (like cycling clubs) and seeing how they feel about using bikes.

3. Questionnaire: involves asking people to respond to specific questions about their bike use, tallying the results, and drawing conclusions.

Since a questionnaire is likely to provide the most information on how people use their bikes (and how they might use their bikes if bikeways were provided), you will be using a questionnaire to help you decide if your community would support a bikeway.

Ask three people to respond anonymously to the questionnaire (you may be one of the three). Try to have different kinds of people answer your questionnaire: males, females, people of different ages, people with various jobs, etc. After your questionnaires are completed, take them to class where you will analyze the data you have collected.

Bikeway Questionnaire

1. What is your sex? _____ Female _____ Male

2. What is your age?

_____ A. under 16
_____ B. 16 to 20
_____ C. 21 to 50
_____ D. over 50

3. Does your family own at least one bicycle?

_____ Yes _____ No

4. How often do you ride a bike?

_____ A. Often (twice a week or more)
_____ B. Frequently (once a week)
_____ C. Sometimes (once a month or less)
_____ D. Never

5. Which reasons below explain why you ride a bike? (You may check more than one reason.)

_____ A. It's a way to get places.
_____ B. It's fun.
_____ C. It's good exercise.
_____ D. It's good for the environment.
_____ E. It saves me money.
_____ F. Other _____(please fill in)
_____ G. I don't ride a bike.

6. Allegheny County officials have proposed a 171 mile bikeway system for the County. It would consist of strips of highway to be used only by bicycles (in some places by joggers also). If such a bikeway were built:

_____ A. I'd be more likely to ride a bike.
_____ B. It wouldn't affect my bike riding at all.
_____ C. I'd be less likely to ride a bike.

7. Do you think a bikeway is a good idea?

_____ A. Yes _____ B. No
_____ C. I need more information.

If you answered A or B above, please give a reason for your answers. If you chose C, what additional information would you like to have?

Bikeway Questionnaire Results

Now that your questionnaires have been completed, you're ready to analyze the data. In small groups, total the responses using a blank questionnaire as a tally sheet. When you have the responses totaled in your group, answer the following questions:

1. a. How many people responded to your questionnaire? _____

   b. How many were male? _____ What percentage were male? _____
   (number of males ÷ number of people)

   c. What percentage were female? _____ (100% - % male)

2. How many families owned at least one bicycle? _____
   What percentage? _____

3. Bicycle Use

	Number	Percent*
Often		
Frequently		
Sometimes		
Never		

*Should add up to 100%

What statement can you make about bicycle use for the people in your sample?

4. Look at your questionnaires again. Tally responses to question 4 by responses to question 2.

	People under 16	People 16-20	People 21-50	People over 50
Often				
Frequently				
Sometimes				
Never				

What relationship, if any, is there between peoples' ages and how often they ride bikes?

5. Categorize and tally:

Reasons People Ride Bikes	Number	Percent*
A. Transportation		
B. Recreation		
C. Health		
D. Environment		
E. Economy		
F. Other		
G. Don't ride a bike		

*The total may add up to more than 100%. Why?

6. How many people felt they'd be more likely to ride a bike if bikeways were available? _____ What percent? _____

7. Qualitative analysis:

Summarize questionnaire responses in a brief paragraph that answers the following questions: Generally, do people in your community think a bikeway is a good idea? Why? What information about a bikeway do they most seem to want?

At this point you should be prepared to compare your questionnaire results with the results of other groups in your class.

ACTIVITY 3. The Bikeway and the Environment

Objectives: This activity will enable students to develop their map-reading and table-interpreting skills. They are expected to identify cause-and-effect relationships, list at least two ways in which the environment might affect the bikeway, and explain how terrain and weather obstacles to a bikeway might be overcome.

Organizing Ideas: Environmental and population factors affect the design and use of a bikeway.

1. topography
2. climate
3. population distribution
4. access and mobility

Resources:

Dougherty, Nina, and Lawrence, William. Bicycle Transportation. United States Environmental Protection Agency, 1974.

Pollock, Rita L. A Study of Bikeway Demand Analysis. University of Pittsburgh, Internship Report, Graduate School of Public and International Affairs, April 1976.

Student Materials:

Transparencies (provided in the Student Materials Packet)

Highway Congestion and Bottlenecks

Development Districts and Population

Proposed Bikeway Route

Handouts (provided in the Student Materials Packet)

The Bikeway and the Environment

Parts A, B, and C. (SM 3.1, 3.2)

Part D (SM 3.3, 3.4)

Part E (SM 3.5, 3.6, 3.7)

Part F (SM 3.8)

Suggested Procedures:

1. Parts A-C, SM 3.1-2, which involve examining and comparing three Allegheny County maps (transparencies) in relation to possible bikeway routes, can be completed by students working individually or in groups. In addition to explaining the map symbols, it might be necessary to define bottleneck (a narrow section of highway that slows down traffic), critical intersection (a place where two or more heavily traveled roads cross, creating traffic jams), and congestion (heavy traffic resulting in slow movement).

   Answers to the questions raised are:

   A.1. - central Allegheny County (Pittsburgh); eastern Allegheny County

   A.2. - downtown Pittsburgh (central business district)

   B.1. - The greater the population density, the more traffic bottlenecks and critical intersections there are.

   B.2. - For commuter use, a bikeway should lead to the central business district. For recreational use it should lead to parks.

2. While Parts D (Topography) and E (Climate) are intended for all students, the class might be divided into two groups, with each group completing one section and summarizing their findings for the rest of the class.

3. Part D, SM 3.3-4, introduces the environmental factor of topography (or terrain) and its effect on bikeway routes and feasibility. The table on SM 3.3 is intended to be used in conjunction with the "Development Districts and Population" and the "Proposed Bikeway" maps. Answers to the questions raised are:

   D.1. - Vacant land contains no buildings; it is largely unused by people, except perhaps by hikers.

   D.2. - Technically, slope is the number of feet that land rises or falls per hundred feet of distance (thus, land with a 10% slope would rise or fall 10 feet in every hundred); however, it is sufficient that students understand slope as hills, inclines, or angles, with higher numbers indicating more or greater slope.

   D.3. - very steep (a.) Part 3 (below) might be introduced at this point.

   D.4. - districts 1, 7, and 8 in the northern and western sections of the county

   D.5. - The proposed bikeway route does not cross districts 1 or 7, but does go through district 8.

   D.6. - Bikeways and steep land do not mix; it is nearly impossible, even with a lightweight 10-speed bike, for most people to bicycle up steep slopes.

   D.7. - walkways (walk bikes over steep parts), elevated bikeways, alternative routes

   D.8. - stay in good physical condition, walk the bicycle, obtain a 10-speed bike

3. To further illustrate the effects of topography, particularly slope:

   a. Elevate an eight-foot length of board at a slope of 25 percent. (If land has a slope of 25 percent, it rises (or falls) 25 feet in every 100 feet; an eight-foot board should rise two feet.)

b. Ask students to walk or bike several blocks in each direction from their homes and then evaluate their home areas in terms of their bikeway potential.

4. Part E, SM 3.5-7, introduces the environmental factor of climate and its effect on bicycling. "Too hot" days are days where the temperature goes over 90° F. "Too cold" days have temperatures below 32° F. Rain or snow days have measurable precipitation. "Potential good days" are the number of days in a month minus the days that are too hot or too cold. "Minimum good days" are the number of potential good days in a month minus the rain or snow days.

5. Part F, SM 3.8 , serves as a review of environment-bikeway considerations, with an emphasis on cause-effect relationships. Review students' answers with the class as a whole, and encourage students to explain their reasoning. The "best" answers for questions 1-5 are a, b, b, a, a; however, other answers can be justified.

The Bikeway and the Environment

If a bikeway were to be constructed in Allegheny County it might have certain effects on the environment: less air pollution, less noise pollution, less congestion. The environment would also affect the bikeway: local topography and climate would influence where the bikeway would be located, the use it would get, and the design of the bikeway. In this activity you will use maps and charts to examine some relationships between environmental factors and bikeway options.

For the bikeway to have any effect on traffic congestion it would have to provide commuters with a way to get where they want to go.

A. Use the "Highway Congestion and Bottlenecks" map of Allegheny County to complete the following sentences.

1. Most of the traffic bottlenecks are in the _____ and _____ sections of the county.

2. The number of traffic bottlenecks and critical intersections increases as you move toward _____.

B. Look at the "Development Districts and Population" map, and compare the information on population with what you've just found about traffic bottlenecks and critical intersections.

1. What appears to be the relationship between traffic and population?

2. For a bikeway to get the most use, where should it be located? (in what parts of the county?)

C. Now, look at the "Proposed Bikeway" map, and compare the proposed route for the bikeway with your answer to question B.2 on page SM 3.1.

1. To what extent does your idea for the location of a bikeway agree with the proposed route?

2. Which areas of Allegheny County are <u>not</u> included in the proposed bikeway route?

3. Why do you think that some areas of Allegheny County are <u>not</u> included in the proposed route for the bikeway?

D. The bikeway route you suggested probably was based on two criteria: where the most people live and where they are likely to be going. The bikeway route proposed by the planners takes one more thing into account — Allegheny County's topography. Allegheny County is not flat: its elevation ranges from 711 feet above sea level at the rivers to 1250 feet above sea level.

Use the information provided in the table below, along with the "Development Districts and Population" map, to answer the questions that follow.

Extent of Slopes on Vacant Land

Development District	Total Acres	Over 25% Slope	Less Than 25% Slope
1	77,200	6,200	50,000
2	39,500	3,400	18,500
3	21,700	3,000	9,500
4	41,700	4,800	22,700
5	34,500	2,300	13,800
6	39,600	2,000	20,100
7	84,900	5,800	51,900
8	92,900	6,100	64,200
9	35,600	1,600	7,300
Total Allegheny County	467,600	35,200	258,000

1. Vacant land is land that --

2. In your own words, define slope.

3. Land with more than 25% slope is

   a. very steep.
   b. nearly level,
   c. good for building.
   d. uncommon in Allegheny County.

4. Which three districts have the most acres of vacant land with a slope over 25%?

   In what sections of Allegheny County are they located?

5. How does the proposed bikeway route deal with the districts with the most sloped land?

6. What is the relationship between steep land and bikeways?

7. How can bikeways be designed to overcome the disadvantages of steep land?

8. How can bike riders overcome the disadvantages of steep land?

9. Bike riders are well aware of the slope of the land they are riding on. Land should not have a slope of 5 percent for more than 300 feet; it should not have a slope of even 2 percent for over 1,500 feet. Given this additional information, how would you evaluate Allegheny County's bikeway potential?

E. "There is no bad weather for bikes, only bad clothing."

While the statement above may be true, how many people would go bicycling if it were 40° F and pouring rain? If it were 15° F, clear, sunny, and windy? Considering the climate in Pittsburgh, how much use is a bikeway likely to get? Study the "Climate and Bicycling" table, and then answer the questions below.

1. Which month of the year has "perfect" temperatures for bicycling (no days too hot nor too cold)?

2. Which month of the year has the largest number of "too cold" days?

3. Which month of the year has the largest number of "too hot" days?

4. How many days of the year are "too hot" for bicycling in Allegheny County?

5. How many days of the year are "too cold" for bicycling in Allegheny County?

   a. Which is a greater obstacle to bicycling in Allegheny County -- heat or cold?

   b. What does this tell you about the area's climate?

6. Which month has the largest number of rain or snow days?

7. Which month has the smallest number of rain or snow days?

8. How many rain or snow days are there in an average year?

9. On any day, what would be the most likely reason NOT to ride a bicycle in Allegheny County: heat, cold, or precipitation? Why?

10. In which month of the year would you be <u>least</u> likely to ride a bike because of the climate? _____
Why?

11. "Potential good days" equals the number of days in a month minus _____.

12. "Minimum good days" equals the number of potential good days in a month minus _____.

13. How might bike riders prepare themselves for "bad" weather (too hot, too cold, too wet)?

14. You can reasonably expect 44.15 percent of the year to be acceptable bike riding weather in Allegheny County. Is this enough to make a bikeway a worthwhile project? (Explain your reasons for your answer.)

How would your answer differ if gasoline cost $1.50 per gallon? $3.00 per gallon?

Month	Number of days	Too Hot	Too Cold	Potential Good Days	Rain or Snow Days	Minimum Good Days
January	31	0	14	17	16	1
February	28.25	0	11	17.25	14	3.25
March	31	0	5	26	16	10
April	30	0	½	29.5	14	15.5
May	31	½	0	30.5	12	18.5
June	30	2	0	28	11	17
July	31	3	0	28	11	17
August	31	2	0	29	9	20
September	30	1	0	29	9	20
October	31	0	0	31	10	21
November	30	0	2	28	13	15
December	31	0	12	19	16	3
TOTAL	365.25	8.5	44.5	312.25	151	161.25
% OF YEAR	100%	2.33%	12.18%	85.49%	41.3%	44.15%

F. Cause and Effect

In questions 1, 2, and 3, an effect (result) is given: select the cause which seems to be the most likely explanation.

1. The effect: Winter is the worst time to ride a bike in Allegheny County. The most likely cause is:

   a. December, January, and February have the fewest "minimum good days."
   b. Cold weather is not good for bike riders.
   c. Bikes can not make it through snow.

2. The effect: Bikeways are usually built on level land. The most likely cause is:

   a. Level land is the easiest to build on.
   b. Bikeways on slopes will probably not be used much.
   c. Eastern Allegheny County has the most level land.

3. The effect: October is the best time to ride a bike in Allegheny County. The most likely cause is:

   a. October is one of the longest months.
   b. October is not too hot or too cold.
   c. October has fewer rain or snow days than December.

In questions 4 and 5, select the effect (result) that most directly follows from the cause.

4. The cause: Eastern Allegheny County has the flattest land. The most likely effect is:

   a. Most people in Allegheny County live in the east.
   b. Most of the proposed bikeway is in the eastern part of the county.
   c. Flattest land is the easiest to build on.

5. The cause: North and South Parks are major recreational areas in Allegheny County. The most likely effect is:

   a. The proposed bikeway will tie these parks together.
   b. Many people will use bikes to get to the parks.
   c. Parks are the safest places to ride bikes.

ACTIVITY 4. Designing a Bikeway

Objectives: In this activity, students list several laws and ordinances that apply to bicycles in Pennsylvania; identify and distinguish the three classes of bikeway; describe and explain some of the traffic signs or markings used with bikeways; explain possible solutions to bicycle parking problems; and make recommendations regarding a bikeway using information on laws and ordinances, space requirements, bikeway classifications, signs and markings, and parking and security.

Organizing Ideas: To maintain and improve the quality of life in urban environments, it is necessary to provide alternative modes of transportation.

1. Presently, most government support for transportation goes to automobiles (e.g., highways, bridges) and mass transit.
2. On the local level, effective transportation planning takes neighborhood needs and wants into consideration.

Resources:

Balshone, Bruce L., Deering, Paul L., and McCarl, Brian D. Bicycle Transit: Its Planning and Design. New York: Praeger, 1975.

Citizens' Advisory Committee on Environmental Quality. From Rails to Trails. Washington, DC: U.S. Government Printing Office, 1975.

GWSM, Inc., and Mackin Engineering Co. Feasibility Study for a Bikeway System in Allegheny County. Allegheny County Department of Planning and Development, 1978.

Student Materials:

Local street map (optional, for Part A)

Meter stick (for Part D)

Bicycle (for Part D)

Sketching and drawing material (paper, crayons, colored pencils, etc.)

Handouts (provided in the Student Materials Packet)

Part A, "What Does a Bikeway Look Like?" (SM 4.1)

Part B, "Bikeway Recommendations" (SM 4.2)

Part C, "Laws and Ordinances" (SM 4.3, 4.4, 4.5)

Part D, "Space Requirements" (SM 4.6)

Part E, "Bikeway Classifications" (SM 4.7, 4.8)

Part F, "Signs and Markings" (SM 4.9, 4.10, 4.11)

Part G, "Parking and Security" (SM 4.12, 4.13)

Suggested Procedures:

1. While Activity 4 can be completed in one class period, it easily can be the basis for several days' activity. It is suggested that students work in groups with each group studying only one aspect of bikeway design. However, the class as a whole might study all the aspects of bikeway design included here.
2. Distribute Part A, "What Does a Bikeway Look Like?" (SM 4.1), and guide students' discussion and choice of a local bikeway route. In selecting a route, encourage students to keep it relatively short. A reasonable distance, e.g., less than one mile, will make it easier for students to accomplish the goal of designing a bikeway. If available, a local street map might be used to facilitate route planning.

3. Once a route has been determined, assign students to study groups of your and/or their choice. Distribute the appropriate handouts to each group (Parts C-G), and indicate that each group should select a reporter to present their findings to the class.
4. When the study groups are ready to make their presentations, distribute Part B, "Bikeway Recommendations" (SM 4.2) for students to complete as a summary and planning guide. Encourage students to raise questions and ask for further information about each study group's recommendations.
5. At this point, students should be well prepared to design their own bikeway. Students might sketch and label their bikeway plan or describe it in a one-two page essay. Plans might be displayed for peer review and later compared and evaluated in a group discussion.
6. Optional follow-up activities might include the following:
   a. a study of successful bikeways such as the one in Davis, California where 60 percent of all rush hour traffic is on bicycles;
   b. an investigation of bicycle use in other countries, particularly the People's Republic of China, the Netherlands, the Scandinavian countries;
   c. an examination of the possibilities of abandoned railroad rights-of way; (The booklet From Rails to Trails (see Resources) provides step-by-step instructions for turning a right-of-way into a bikeway.)
   d. finding out about the 25-mile hiking-biking trail planned by the Western Pennsylvania Conservancy for the Youghiogheny Gorge along an abandoned right-of-way of the Western Maryland Railroad in

Fayette County. (Western Pennsylvania Conservancy, 316 Fourth Avenue, Pittsburgh, PA 15222)

7. Additional information for Parts D and E:

Part D. Space Requirements. A one-lane bikeway should be at least 3.5 feet wide (2 foot bike width plus .75 foot maneuvering width on each side). A two-lane bikeway should be at least 7 feet wide (two 2-foot bikes plus 1 ½ foot maneuvering space for each.

Part E. Bikeway Classifications. To roughly estimate the Average Daily Total of vehicles traveling on a road, observe the road for 10 minutes and count the number of vehicles that pass by. Then multiply the number by 6 (for one hour), and multiply this result by 24 (for one day). Obviously, it is best to avoid "rush hours" for this purpose (presumably late evening-early morning and rush hours would balance out).

Designing a Bikeway

A. What Does a Bikeway Look Like?

It looks like whatever you decide. In this activity you will be designing a bikeway approach to your school. It's true that most neighborhood bicycle trips don't need a bike route; but near a school, where travel is concentrated, a bikeway can make bicycling safer and more pleasant. Keep in mind that "design and planning are not endeavors solely for experts with credentials in those fields " (Balshone, Deering, and McCarl, p. xiii). The people with the best information are often the ones who will use the system!

Before you can design a bikeway you must know the route it will follow. Meeting together as a class, agree on a short route (or routes) that leads to your school. Everyone in the class should clearly understand which area(s) the route will cover.

Once you have decided on a bikeway route, there are several aspects of bikeway design that should be considered before developing a plan. These are (1) laws and ordinances, (2) space requirements, (3) bikeway classes, (4) signs and markings, and (5) parking and security. Separate groups will work on each topic. Study the information for your topic, and answer the questions on the handouts. Be prepared to summarize your information and recommendations for the class.

B. Bikeway Recommendations

1. Laws and Ordinances

2. Space Requirements

3. Bikeway Classifications

4. Signs and Markings

5. Parking and Security

C. Laws and Ordinances Affecting Bikeways

Table 1

PENNSYLVANIA MOTOR VEHICLE CODE, TITLE 75, 1976 EDITION

Chapter 1
Pedalcycle - A vehicle propelled solely by human-powered pedals.

Chapter 35 (Sub-Chapter A)
Fine for violation of Code $10.00.
One rider only (except adult with child secured to rider in backpack or sling).
General Rule - Use right side of two-way roadway.
May use left side on one-way roadway if two traffic lanes.
Not more than two abreast, except on exclusive bikeway.
Must use bike lane, if provided, on roadway.
At least one hand on handlebars.
Need front lamp (white), red reflector or lamp (red) on rear for operation - sunset to sunrise.
Audible signal device (optional).
Yield right-of-way to pedestrian on sidewalk and bike path.
No use of sidewalks in business district, unless permitted by traffic control device (sign, etc.).
May park on sidewalk, unless prohibited by official traffic control device (sign, etc.).
May park on road where parking is allowed (shall not obstruct movement of legally parked vehicle).

Chapter 37 - Sect. 3711 (a)
"No person on a pedalcycle shall hold fast or attach the device to any moving vehicle" while riding.

Chapter 43 - Sect. 4303 (c)
Turn signals and hazard warning lights not required on pedalcycles.

Chapter 61 - Sect. 6109
Permits "regulating the operation of pedalcycles and requiring their registration and inspection, and the payment of a reasonable registration fee" by local authorities.

Chapter 63 - Sect. 6308 (a)
Operator of pedalcycle shall stop upon request or signal of any police officer and upon request exhibit a registration card or other means of identification.

1. Check Table 2 to see if your community has any bicycle/bikeway regulations in addition to Title 75 of the Pennsylvania Motor Vehicle Code. (If your community is not listed in Table 2, assume that there are no other restrictions.) List any additional regulations in your community.

2. According to Chapter 35 (Table 1) where may bikes travel?

3. List at least four safety precautions which bike operators must take.

   a.

   b.

   c.

   d.

4. Who has the right-of-way, pedestrians or bike riders?

5. What is the fine for bicyclists who violate the Motor Vehicle Code?

6. What are some advantages and disadvantages of inspection and registration of bicycles (Chapter 61)?

Advantages	Disadvantages

7. If your community does not require inspection and registration of bicycles, would your study group recommend it? Why?

8. What other regulations would you recommend for your proposed bikeway? (See Table 2 for some ideas.) Be prepared to explain the reasons for your recommendations.

Table 2

Local Bicycle Regulations in Allegheny County

Ordinances Statutes Regulations	Braddock	Braddock Hills	Chalfant	Churchill	E. McKeesport	Edgewood	Forest Hills	McKeesport	Monroeville	N. Versailles	Oakmont	Penn Hills	Pitcairn	Pittsburgh	Plum	Swissvale	Turtle Creek	Verona	White Oak	Wilkinsburg	Wilmerding	E. Pittsburgh	Rankin	N. Braddock
PA MOTOR VEHICLE CODE - TITLE 75	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NO SIDEWALK USAGE						X								X						X				
NO SIDEWALK USAGE IN BUSINESS DIST.											X													
REGISTRATION					X			X			X							X						
LICENSE								X			X													
LICENSE AND FEE					X			X						X										
FINES						X		X			X			X										
BIKE SAFETY PROGRAM (INSPECTION)					X	X		X			X	X						X	X					
AGE RESTRICTION														X										
DESIGNATED STREETS BARRED TO BIKES					X			X																
NO CROSSING UNSIGNALED INTERSECTION								X																
SINGLE FILE ONLY								X			X													
NO MORE THAN TWO ABREAST						X																		
NO TANDEM RIDING W/O CARRYING DEVICE								X			X			X										
TANDEM RIDING WITH CARRYING DEVICE											X													
NO UNAUTHORIZED RACING								X																
2 HANDS ON HANDLEBARS						X		X			X													
NO RIDERS ON HANDLEBARS														X										
BELL OR GONG														X										
NO RACING														X										
NO COASTING														X										
NO MORE THAN 3 ABREAST														X										
MAX. SPEED 10 MPH														X										

D. Bikeway Space Requirements

How much space does a bicycle need? Find out by measuring a bicycle and completing the chart below

Space Needed By a Bike and Rider

Width at handlebars	
Length	
Vertical space occupied by a rider and a bike	
Pedal clearance	
Space above needed for "comfort" and safety	
Space on each side needed for "comfort" and safety	

Now use your findings to answer the following questions.

1. How wide should a one-lane bikeway be? _____
   Why?

2. How wide should a two-lane bikeway be? _____
   Why?

3. Is it possible to provide a one-lane or a two-lane bikeway along the route you've selected? Explain the reasons for your conclusions.

4. How do obstructions such as trees, poles, barriers, and parked cars along your route affect its safety?

5. Now, summarize your recommendations (for a one or a two-lane bikeway). Be prepared to explain the reasons for your choice.

E. Bikeway Classifications

There are three classes of bikeway. The information provided below will help you to decide which is best for the route you have chosen.

Class I	Class II	Class III
- For exclusive use of bikes, completely separate from auto and pedestrian traffic	- Next to, but separated from auto and pedestrian traffic by markings	- Roadway is marked as a bicycle route, but is also open to autos; no separate bicycle lane.
- Most often found in open spaces, parks, river banks	- Easy to set up as part of the traffic pattern that already exists	
- Most expensive		- Least expensive
- Safest		- Least safe

In order to select the appropriate bikeway class for your route, you will need the following information:

Major roads traveled by your bike route	Posted speed on on each road	Estimated number of vehicles that use each road every day (ADT = Average Daily Total)

Class III bikeways are considered acceptable if the road carries less than 2,000 vehicles per day, and the speed limit is 35 mph or less.

Class II bikeways are considered acceptable if the road carries between 2,000 and 3,500 vehicles, and the speed limit is between 35 and 40 mph.

Class I bikeways are needed if the speed limit is over 40 mph, no matter how many vehicles use the road. If more than 3,500 vehicles use the road every day, a Class I bikeway is needed, no matter what the speed limit.

1. What are the advantages of a Class I bikeway?

2. Why is a Class I bikeway most difficult to construct?

3. What are the disadvantages of a Class III bikeway?

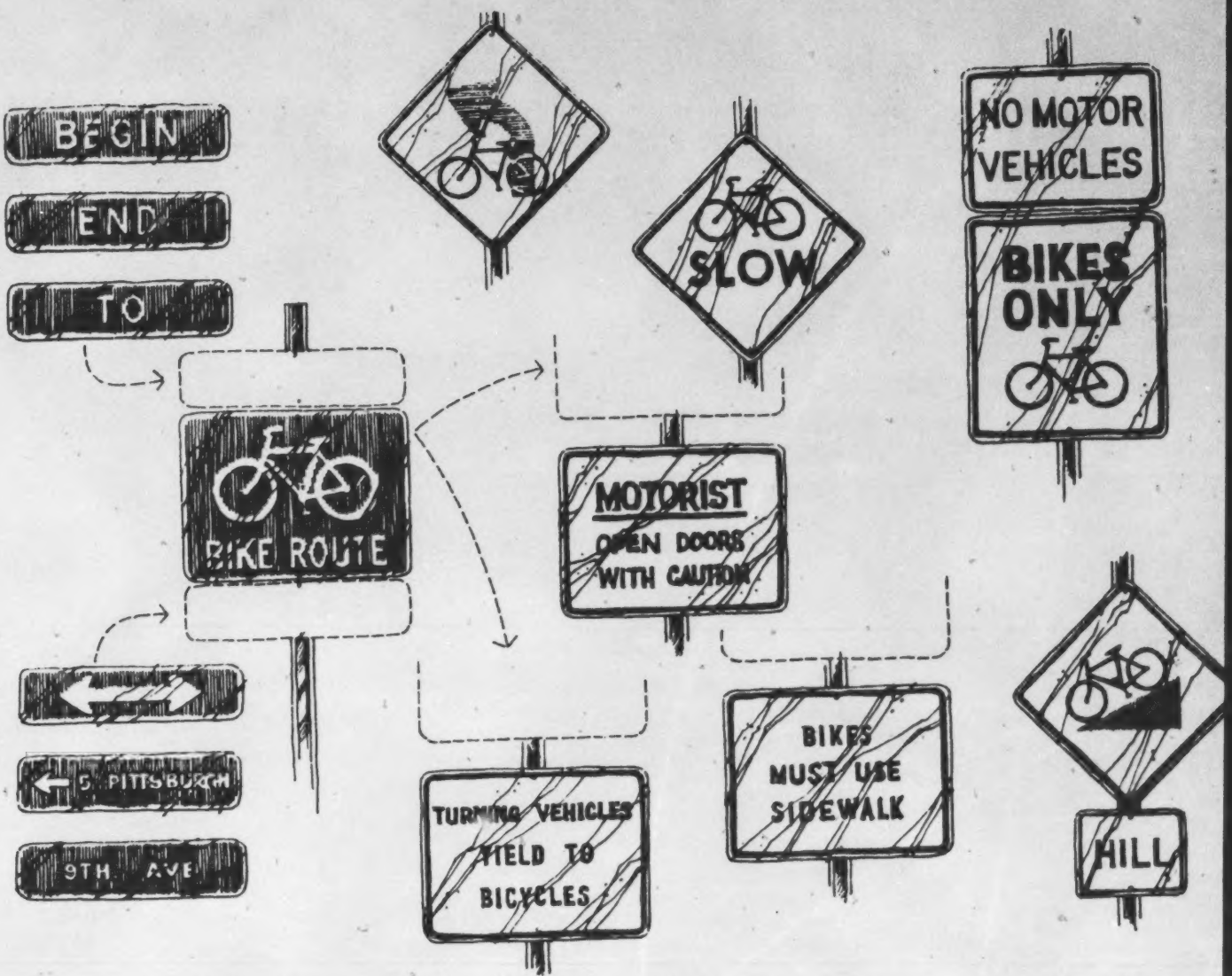
4. Class II bikeways are usually considered to be an acceptable compromise. Why do you suppose this is so?

5. Which class (or classes) of bikeway do you recommend for your route? What are the reasons for your choice?

F. Signs and Markings

The biggest safety hazard faced by a bike rider is the car. Signs, markings, and separators can improve the safety of your bikeway. Signs give instructions to bike riders and to motorists. Signs should be posted before points of contact between cars and bikes and before hazards.

Study the signs shown here and decide which are needed for your bike route. Also decide where they should be placed.



What special conditions along your route might need a sign not illustrated here? What additional signs do you need?

Barriers and separators help to keep cars and bikes apart. Some suggestions for barriers and separators are given here.

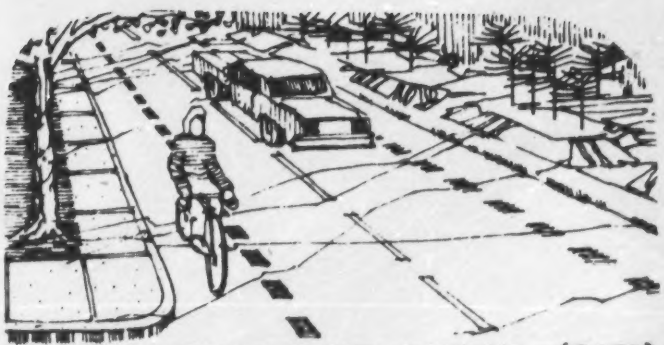
Planted barrier between bikes and cars
Built-up curb between bikes and cars
Full-width colored pavement marker
Painted line barrier
Dots (reflectorized pavement markers)

What are some advantages and disadvantages for each type of barrier? Which one(s) would be good choices for your bikeway?

What other types of barriers or separators might be used?

Now, summarize your recommendations for bikeway signs and markings and for barriers and separators. Be prepared to explain the reasons for your choices.

FULL WIDTH COLORED PAVEMENT MARKER



REFLECTORIZED PAINT MARKING (DOTS)

G. Parking and Security

Where to park your bike and how to keep it from being stolen are other problems bike riders must face. (17 percent of all larcenies in the U. S. involve bikes!)

Some suggestions follow:

Locker (user provides lock)
Steel post with case-hardened chain (user provides lock)
Coin-operated bicycle rack that locks the frame and both wheels
Hook for vertical storage (bike hangs by wheel on hook)
Parking bay

What are some other ideas?

BICYCLE LOCKERS

Lockers are being considered at some "Park-n-Ride" locations by the Port Authority of Allegheny County.

PARKING BAY

Permanent bays constructed of concrete are often found at educational institutions or in parks.

1. List advantages and disadvantages for each parking option. Be sure to consider cost, space needed, security of bike, how it will look, and where you will locate the parking facilities.

Bicycle Parking	Advantages	Disadvantages
Lockers		
Posts		
Racks		
Hooks		
Bays		
_____		
_____		

2. Which type of bicycle parking do you recommend for your bikeway? Be prepared to explain the reasons for your choice.

ACTIVITY 5. Should Allegheny County Construct a Bikeway?

Objectives: In this activity students calculate the cost of operating and maintaining a bikeway, list three arguments in favor of building a bikeway, list three arguments opposed to building a bikeway, evaluate arguments proposed for and against a bikeway, and decide whether Allegheny County should construct a bikeway.

Organizing Ideas:

1. Sound urban transportation decisions require consideration of available options in terms of the evidence and one's goal(s).
   a. Each urban transportation option has advantages and disadvantages.
   b. There is no ideal mode of urban transportation: when environmental, health and safety, economic, and other factors are considered, there is no single best means of transportation in urban areas.
2. In a democratic political system, policy decisions are based on input from various interested parties.

Resources:

Balshone, Bruce L., Deering, Paul L., and McCarl, Brian D. Bicycle Transit: Its Planning and Design. New York: Praeger, 1975.

Breines, Simon, and Dean, William J. The Pedestrian Revolution: Streets Without Cars. New York: Vintage, 1974.

Dougherty, Nina, and Lawrence, William. Bicycle Transportation. United States Environmental Protection Agency, 1974.

GWSM, Inc., and Mackin Engineering Co. Feasibility Study for a Bikeway System in Allegheny County. Allegheny County Department of Planning and Development, 1978.

Student Materials:

Handouts (provided in the Student Materials Packet)

Bikeway Costs (SM 5.1, 5.2)

Decision-Making Map (from Activity 1)

Transparency (provided in the Student Materials Packet)

Decision-Making Map (same as handout)

Suggested Procedures:

1. Since the overall purpose of this module is to encourage and assist students to make reasoned decisions about a crucial urban environment-quality of life issue, it would be desirable to review the students' findings from previous activities, particularly the quality of life goal(s) for transportation in urban environments that they identified in Activity 1, and communicate the importance of informed citizens making rational choices.
2. Focus on the advantages and disadvantages of a bikeway as a means of reaching the identified goal(s). After reviewing information from previous activities, distribute the handout, "Bikeway Costs" (SM 5.1-2) for students to complete individually or in small groups. In a follow-up discussion, ask students to consider:
   a. Who actually pays when money comes from the national and state governments?
   b. (The 151 miles of bikeway referred to in question #2 do not include 15 miles of bikeway already existing in Pittsburgh and four miles of bikeway already planned in the eastern suburbs.) Why is operation and maintenance of the proposed bikeway likely to cost more than the estimates?

c. Putting bikeway costs in perspective:

-- It now costs well over $1,000,000 to construct one mile of highway in a city (and that does not include maintenance costs).

-- Oregon, Washington, California, and Michigan have all set aside a fixed percentage (usually 1%) of all gasoline tax revenues for investment in bicycle facilities. Obviously enough people in these states feel bikeways are a good use of the money.

3. Return to the Decision-Making Map (handout, transparency, or both), and ask students to add the relevant information about bikeway costs.
4. Ask students to complete the decision-making process, either working individually and then sharing their conclusions, or in a large group discussion format.
5. Optional follow-up:
   a. Identify and discuss advantages and disadvantages of ways in which students can make their positions on the proposed bikeway known to local and county government officials.
   b. Encourage students to follow through, by taking one or more of the actions discussed above.

Bikeway Costs

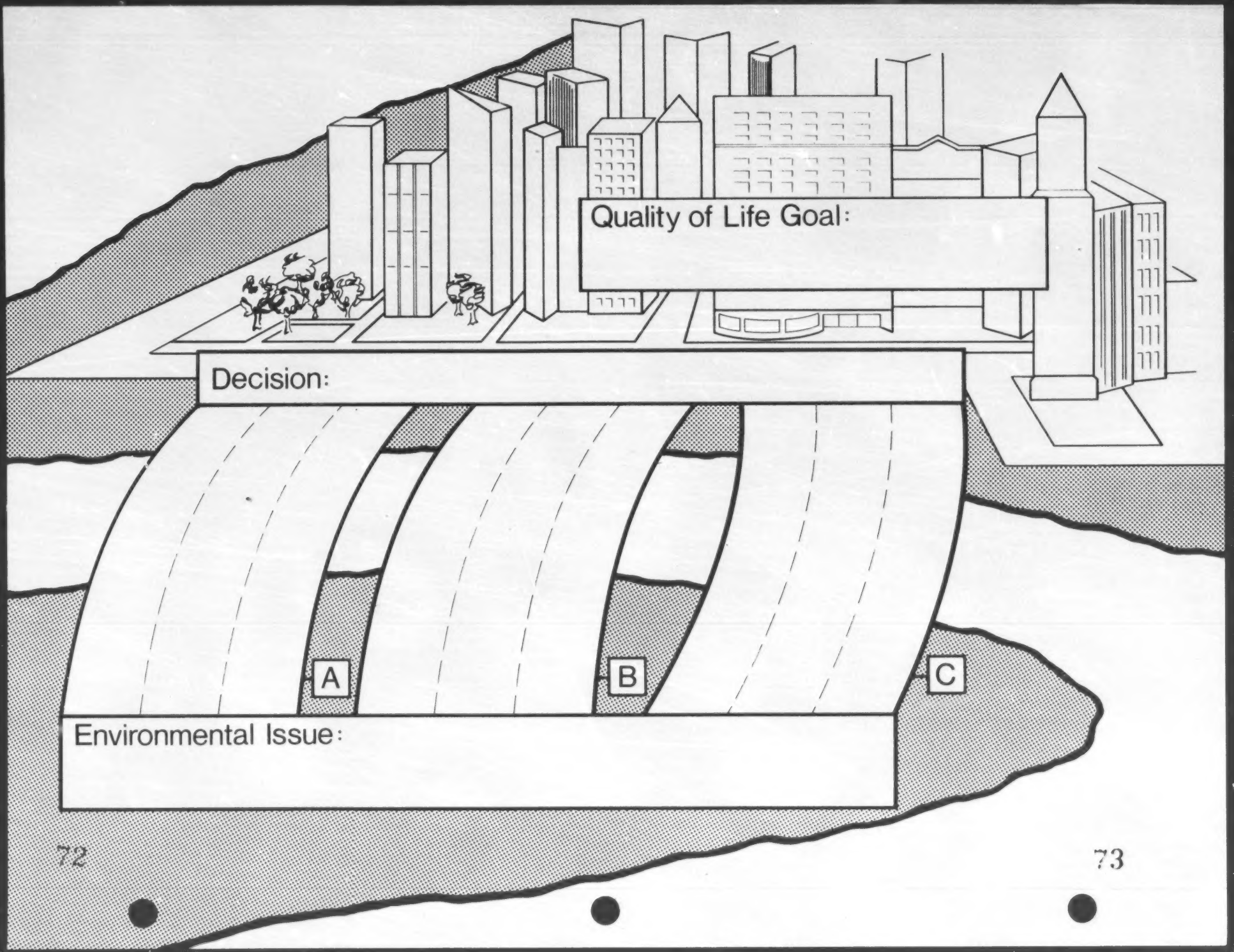
Before reaching conclusions about a bikeway for Allegheny County, it is important to consider the economic costs and benefits. The cost of constructing the proposed bikeway is estimated to be $5,600,000. This money will probably come from the federal and state governments. If the proposed bikeway is built, it must be maintained. Read the chart below, and complete the last column.

Type of bikeway	Number of miles	Maintenance needed	Cost per mile per year	Total cost per year
Class I	35	pavement, barriers signs, striping, drainage, lighting, litter cleanup	$1,800	
Class II	27	signs, striping, litter cleanup	$2,200	
Class III	89	signs, litter cleanup	$ 900	

2. Approximately how much would it cost each year to operate and maintain the 151 miles of bikeway describes in the chart?

3. Allegheny County Planning Director David O'Loughlin says, "The purpose of the system is two-fold: giving people an alternative to driving and giving them a chance to have fun riding a bike."

   Now that you know how much a bikeway would cost, how good a use of our money does it seem to be? In addition to money, consider energy and environmental, health and safety costs.


Quality of Life Goal:
Decision:
A
B
C
Environmental Issue:

Urban Transportation: Where Are We Going?

MODULE EVALUATION

Please complete immediately after module use and return to C. Combleth, 4A01 Forbes Quadrangle, University of Pittsburgh, Pittsburgh, PA 15260.

Teacher _____ School _____

Address _____

Grade/Subject Area _____ Date _____

A. Module Use Checklist

Please indicate whether you and/or your students used each section of this module by circling either YES or NO.

YES NO 1. Overview

YES NO 2. Teacher Background Information

YES NO 3. Activity Preview

YES NO 4. Pretest

(Activity 1. Transportation in Urban Environments)

YES NO 5. Transporation in Urban Environments

YES NO 6. Decision-Making Map

(Activity 2. Who Wants a Bikeway?)

YES NO 7. Who Wants a Bikeway?

YES NO 8. Bikeway Questionnaire

YES NO 9. Bikeway Questionnaire Results

YES NO 10. Activity 3. The Bikeway and the Environment

(Activity 4. Designing a Bikeway)

YES NO 11. What Does a Bikeway Look Like?

YES NO 12. Bikeway Recommendations

YES NO 13. Laws and Ordinances

YES NO 14. Space Requirements

A. Module Use Checklist - continued

YES NO 15. Bikeway Classifications

YES NO 16. Signs and Markings

YES NO 17. Parking and Security

(Activity 5. Should Allegheny County Construct a Bikeway?)

YES NO 18. Bikeway Costs

YES NO 19. Decision-Making Map

B. Initial Reactions

Please comment briefly on each of the following aspects of the module.

1. Importance of (knowledge, skills, and attitudinal) objectives:

2. Significance of content:

3. Appropriateness of activities (procedures, materials):

4. Useability, ease of teaching, practicality:

5. Student reactions:

6. Your overall reaction to the module (check one):

___ Very Positive; ___ Positive; ___ Neutral or Uncertain;

___ Negative; ___ Very Negative

Thank you.